

PATENT ABSTRACTS OF JAPAN

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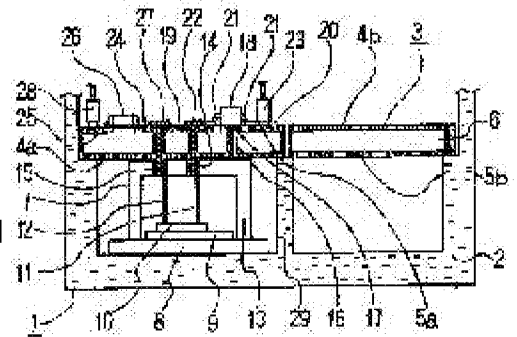
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(54) STRUCTURE OF MOUNTING ELECTRONIC PART

(57)Abstract:

PURPOSE: To suppress electromagnetic noise by surrounding an inverter module being an electromagnetic source and a control circuit separately with metals, and providing the input/output line of from the inverter module effectively with a capacitor or an inductor.

CONSTITUTION: A circuit board is made a multilayer printed board 3, and shield layers 4a and 4b are provided at the lowermost layer or the uppermost layer, and high frequency module circuits 5a and 7 and control circuit 5b are arranged in the space surrounded by these shield layers 4a and 4b and a metallic casing 2, and besides a through capacitor 18, between the input line 23 from a high frequency circuit and a ground layer 17, on the power circuit 5a where the high frequency circuit module is mounted, and an inductor 26, in the output lines 24 and 28, are provided. Hereby, the radiative and conductive noise leaking from the inverter module is restrained, and the radiative noise from the control circuit 5b is also restrained.



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Notes:

1. Untranslatable words are replaced with asterisks (****).
2. Texts in the figures are not translated and shown as it is.

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FULL CONTENTS

[Claim(s)]

[Claim 1] In order to operate the electromagnetic wave source which generates the mounting structure (a) electromagnetic waves of an electric device which have the following elements, the substrate which has an element below (b), and the above-mentioned (b1) electromagnetic wave source, In order to perform different control from the electromagnetic wave source circuit part and the above-mentioned (b2) electromagnetic wave source circuit part which were prepared in a part of one field of the substrate, The control circuit part prepared in the portion in which it is the field of another side of a substrate and the electromagnetic wave source circuit part is not prepared, (b3) The case which is connected with the shield layer and the above-mentioned (b4) shield layer which are prepared in the portion of the field of another side of the substrate corresponding to the above-mentioned electromagnetic wave source circuit part and a control circuit part, respectively, and control the electromagnetic waves from an electromagnetic wave source, and covers electromagnetically the above-mentioned electromagnetic wave source and a control circuit part from the outside.

[Claim 2] It is the mounting structure of the electric device according to claim 1 characterized by equipping a case with the shield wall connected with the above-mentioned shield layer between the above-mentioned electromagnetic wave source and the control circuit part in the mounting structure of the above-mentioned electric device.

[Claim 3] The electromagnetic wave source which generates the mounting structure (a) electromagnetic waves of an electric device which have the following elements, (b) It has a substrate, and the input (b1) part, the output part, the input terminal to the above-mentioned electromagnetic wave source and output terminal which have the following elements. In order to control the electromagnetic waves from the electromagnetic wave source circuit established in one field of the substrate in order to operate an electromagnetic wave source, and the above-mentioned (b2) electromagnetic wave source, The shield layer prepared in the field of another side of a substrate, the capacitor which is connected between the (c) above-mentioned input part and an input terminal, and has capacity between the above-mentioned shield layers, the inductor connected between the (d) above-mentioned output part and the output terminal.

[Claim 4] The substrate which has the circuit which generates electromagnetic waves using the electromagnetic wave source and the (b) above-mentioned electromagnetic wave source which generate the mounting structure (a) electromagnetic waves of an electric device which have the following elements, a

connection means to connect a substrate with the (c) above-mentioned electromagnetic wave source enabling free attachment and detachment.

[Detailed Description of the Invention]

[0001]

[Industrial Application] In an electric device like inverter equipment, while this invention enables it to prevent disclosure of an electromagnetic wave noise, it is assembled and relates to the mounting structure of an electric device of improving service nature.

[0002]

[Description of the Prior Art] Drawing 3 is the sectional view showing the internal structure of the mounting structure of the conventional electric device shown in JP,H2-26294,U. In this figure, the shield layer arranged as prepared an electric device and 2 in the case of the electric device 1, 3 prepared in a multilayer printed circuit board, 4 prepared in the multilayer printed circuit board 3 and the electromagnetic wave source 7 most approached in 1, and 7 are the electromagnetic wave sources arranged in the space enclosed by the case 2 and the multilayer printed circuit board 3.

[0003] Since it is magnetized with the pattern of the shield layer 4 prepared in the multilayer printed circuit board 3 of the place with the noise nearest to the electromagnetic wave source 7 generated in the electromagnetic wave source 7 in the mounting structure of the electric device constituted as mentioned above, The noise of the electromagnetic wave source 7 is shielded by the grade which does not have on the signal wire of a mounting part.

[0004]

[Problem to be solved by the invention] Although the mounting structure of the conventional electric device is constituted as mentioned above and the noise magnetized by the electromagnetic wave source 7 is controlled by the shield layer Since the electromagnetic wave source 7 is connected with the circuit pattern of the printed circuit board though natural, It is not taken into consideration to the noise which does not have a means to control from the pattern or line of input and output in any way to the electromagnetic wave noise revealed to a power supply circuit and a control circuit, and is emitted from these circuit pattern sides. Furthermore, in order to base the electric connection between the electromagnetic wave source 7 and the multilayer printed circuit board 3 on soldering etc., there were problems, like attachment and removal are difficult and there are.

[0005] It was made in order that this invention might solve the above problems, and it aims at acquiring the noise prevention structure which can control the noise revealed on the electromagnetic wave source 7 and the outskirts of it, and aims at offering the still easier method of assembling.

[0006]

[Means for solving problem] For example, separate into the power supply circuit where the multilayer printed circuit board is attached to the electromagnetic wave source, and the control circuit which controls the power supply, and the mounting structure of the electric device concerning the 1st invention constitutes the circuit pattern side and shield layer of a control circuit so that the front reverse side may be conflicted in the case of a power supply circuit. It has the following elements.

(a) In order to operate the electromagnetic wave source which generates electromagnetic waves, the substrate which has an element below (b), and the above-mentioned (b1) electromagnetic wave source, In order to perform different control from the electromagnetic wave source circuit part and the above-mentioned (b2) electromagnetic wave source circuit part which were prepared in a part of one field of the substrate, The control circuit part prepared in the portion in which it is the field of another side of a substrate and the electromagnetic wave source circuit part is not prepared, (b3) The case which is connected with the shield layer and the above-mentioned (b4) shield layer which are prepared in the portion of the field of another side of the substrate corresponding to the above-mentioned electromagnetic wave source circuit part and a control circuit part, respectively, and control the electromagnetic waves from an electromagnetic wave source, and covers electromagnetically the above-mentioned electromagnetic wave source and a control circuit part from the outside.

[0007] For example, it separates into the power supply circuit where the multilayer printed circuit board is attached to the electromagnetic wave source, and the control circuit which controls the power supply, and the mounting structure of the electric device concerning the 2nd invention shields an electromagnetic wave source and a control circuit individually with the shield wall of a case and a case.

[0008] The mounting structure of the electric device concerning the 3rd invention possesses a penetration capacitor between the input line of an electromagnetic wave source, and a shield layer in the circuit pattern side of the power supply circuit of a multilayer printed circuit board, for example. The inductor is provided in the output line of an electromagnetic wave source, and it has the following elements.

(a) The electromagnetic wave source which generates electromagnetic waves, the substrate which has an element below (b), In order to control the electromagnetic waves from the electromagnetic wave source circuit established in one field of the substrate in order to have an input part, an output part, an input terminal to the above-mentioned electromagnetic wave source, and an output terminal and to operate an electromagnetic wave source, and the above-mentioned (b2) electromagnetic wave source, (b1) The shield layer prepared in the field of another side of a substrate, the capacitor which is connected between the (c) above-mentioned input part and an input terminal, and has capacity between the above-mentioned shield layers, the inductor connected between the (d) above-mentioned output part and the output terminal.

[0009] The mounting structure of the electric device concerning the 4th invention possesses the plug terminal which penetrates a printed circuit board for the connection method of a multilayer printed circuit board and an electromagnetic wave source for the terminal by the side of a multilayer printed circuit board. In the electromagnetic wave source side, the connection means possessing an electric socket terminal constitutes, and it has the following elements.

(a) The substrate which has the circuit which generates electromagnetic waves using the electromagnetic wave source and the (b) above-mentioned electromagnetic wave source which generate electromagnetic waves, a connection means to connect a substrate with the (c) above-mentioned electromagnetic wave source enabling free attachment and detachment.

[0010]

[Function] since the circuit pattern side and shield layer of the control circuit part were constituted in the 1st invention so that the front reverse side might be conflicted in the case of an electromagnetic wave source circuit part -- guidance in the control circuit part of an electromagnetic wave source -- electromagnetism -- the influence of a boundary can be inhibited. Moreover, a control circuit is electromagnetically covered from

the outside by connecting a case with a shield layer in the electromagnetic wave source in the inside of ** constituted by the case and the shield layer.

[0011] In the 2nd invention, about the noise revealed from an electromagnetic wave source to a control circuit, it shields in electromagnetic wave with the shield layer and the shield wall, and disclosure of an electromagnetic wave noise is controlled by these.

[0012] In the 3rd invention, the electromagnetic wave noise revealed from this input part to the power supply side by the penetration capacitor which the input line of an electromagnetic wave source penetrates is bypassed by the shield layer, and the noise around which it turns from an output part to an input part by the inductor prepared in the output part is controlled.

[0013] In the 4th invention, by connection means, such as a plug terminal with which the multilayer printed circuit board was equipped, and an electric socket terminal with which the electromagnetic wave source was equipped, attachment and detachment of an electromagnetic wave source and a multilayer printed circuit board are attained, and an assembly and the work at the time of service become easy, for example.

[0014]

[Working example] Work-example 1. drawing 1 and 2 show one work example of this invention, and 1 The electric device of this invention (inverter equipment), The metaled case where 2 constitutes the electric device 1, and 3 constitute the electric device 1. The multilayer printed circuit board electrically fixed to the case 2 and 4a constitute the multilayer printed circuit board 3. The shield layer which prepared in the bottom of the heap of the power supply circuit pattern side 5a, and approached the electromagnetic wave source 7, 4b constitutes the multilayer printed circuit board 3, and disagrees with the control circuit pattern side 5b. The shield layer prepared on the same plane as the power supply circuit pattern side 5a and 5a constitute the multilayer printed circuit board 3. The power supply circuit pattern side which is one of the fields which disagree with the shield layer 4a, and constitutes a power supply circuit, 5b constitutes the multilayer printed circuit board 3, and is in the power supply circuit pattern side 5a and an opposite field. The control circuit pattern side which constitutes a control circuit, the insulating board from which 6 insulates electrically the shield layers 4a and 4b and the circuit pattern sides 5a and 5b, The metal chassis for connecting 7 to the power supply circuit pattern side 5a electrically, and electromagnetic wave sources, such as an inverter module which contacts a case 2 electrically and thermally and supplies a high frequency output, and 8 constituting the bottom of the electromagnetic wave source 7, and contacting a case 2 electrically and thermally, The module board by which 9 was attached on the metal chassis 8, and 10 are arranged on the module board 9. The power element combined with circuit composition like drawing 2 and 11 are laid underground into the electromagnetic wave source 7. The lead which leads to the input of the power element 10, the output lead which 12 is laid underground into the electromagnetic wave source 7, and leads to the output of the power element 10, The plastic case which 13 constitutes the electromagnetic wave source 7 and encloses the module board 9, The electric socket terminal which 14 is embedded in the plastic case 13 and is electrically connected with the input lead 11, The electric socket terminal which 15 is embedded in the plastic case 13 and is electrically connected with the output lead 12, The through hole which 16 penetrates the insulating board 6 and connects the shield layer 4a to the power supply circuit pattern side 5a electrically, The spot ground which 17 is prepared in the power supply circuit pattern side 5a, and connects with a through hole 16 electrically, Connect 18 electrically on the spot ground 17, and the penetration capacitor which has electric capacity between grounds like drawing 2 , the circuit pattern with

which 19 and 20 constitute the power supply circuit pattern side 5a, and 21 come out from the both ends of a penetration capacitor, and one of the two [the circuit pattern 19] Fix electrically and mechanically to the circuit pattern 19 the lead terminal which has already fixed one of the two to the circuit pattern 20 electrically, and 22, and the insulating board 6 of a multilayer printed circuit board is penetrated. For the electric socket terminal 14, electrically Connection and the plug terminal inserted removable, The input path cord for 23 being electrically connected to the circuit pattern 20, and connecting with the power supply line of the case exterior, 24, the circuit pattern with which 25 constitutes the power supply circuit pattern side 5a, and 26 -- one of the two -- the circuit pattern 24 -- [one of the two / it connects with the circuit pattern 25 electrically, and] already The inductor which has an inductance in an output line like drawing 2 , and 27 are electric to the circuit pattern 24. Fix mechanically, penetrate the insulating board 6 and it connects with the electric socket terminal 15 electrically. And the output path cord for the plug terminal inserted removable and 28 being connected to the circuit pattern 25, and connecting with the load line of the case exterior and 29 constitute a case 2, and are located in the terminal area of the shield layers 4a and 4b. It is the shield wall which connects with these electrically and divides the electromagnetic wave source 7 and the control circuit pattern side 5b.

[0015] [the electromagnetic wave noise which generates this work example from inverter equipment / be / mainly / the conduction from an inverter module main part and the radiation noise, and the radiation noise from a control circuit which are an electromagnetic wave source / main] The inverter module and control circuit which are an electromagnetic wave source are separately enclosed with metal. That is, the shield layers 4a and 4b are formed in the bottom of the heap or the top layer by using a circuit board as the multilayer printed circuit board 3, and an inverter module (high frequency circuit module) and a control circuit are arranged to the space enclosed with these shield layers 4a and 4b and the metal case 2.

[0016] [namely, the mounting structure of the inverter equipment in this example] By having established the power supply circuit of the multilayer printed circuit board 3 in the power supply circuit pattern side 5a and the shield layer 4a, having established the control circuit in the control circuit pattern side 5b and the shield layer 4b, and having dissociated, respectively guidance to the control circuit of the electromagnetic wave source 7 -- electromagnetism -- it controls sharply by having inhibited the influence of a boundary a little and having shielded individually with the shield wall 29 further. Moreover, it reveals from the electromagnetic wave source 7 to a control circuit by conduction, and since the electromagnetic wave noise emitted from the circuit pattern side 5b or mounting parts is confined in the space enclosed by the shield layer 4b, the case 2, and the shield wall 29, it can control radiation out of a case.

[0017] Furthermore, since the electromagnetic wave noise revealed to the circuit pattern 19 of the input of the electromagnetic wave source 7 is bypassed by the shield layer 4a by the penetration capacitor 18, The disclosure to the input path cord 23 can be controlled, and also since the electromagnetic wave noise revealed to the circuit pattern 24 of an output is prevented by the inductor 26, it can control the disclosure to the output path cord 28, and it will control all the electromagnetic waves revealed to the exterior of a case 2 by this. In addition, since it becomes possible easily in connection between the multilayer printed circuit board 3 and the electromagnetic wave source 7 only by **** of the electric socket terminals 22 and 27 and the plug terminals 14 and 15, an assembly and the work at the time of service become easy.

[0018] As mentioned above, it sets in the mounting structure of the electric device characterized by using for this work example one layer of the nearest multilayer printed circuit board on the electromagnetic wave

source stored in the case in order to control the noise from an electromagnetic wave source. A multilayer printed circuit board is divided into an electromagnetic wave source circuit part and the control circuit part of the electromagnetic wave source. the circuit pattern side and shield layer of a printed circuit board of a control circuit part -- the case of an electromagnetic wave source part, and the front reverse side -- it is characterized by having presupposed that it is opposite and arranging an inductor between the output terminals of a penetration capacitor, an output part, and an electric device between the input part of the electromagnetic wave source part on a printed circuit board, and a shield layer.

[0019] Moreover, it has the shield wall which covers electromagnetically an electromagnetic wave source and the control circuit on a multilayer printed circuit board in some cases, and is characterized by considering it as the structure which the shield wall joins to a shield layer.

[0020] Furthermore, it sets in the structure of connecting the penetration capacitor or inductor, and electromagnetic wave source of the above-mentioned printed circuit board. It is characterized by providing an electric socket terminal in the plug terminal [which penetrates a circuit to the penetration capacitor side edge child or inductor side edge child on the printed circuit board of a contact button part], and electromagnetic wave source side.

[0021] In the work-example 2. above-mentioned work example 1, although the case where a multilayer printed circuit board was divided into an electromagnetic wave source circuit part and the control circuit part of the electromagnetic wave source was shown, the case where it has the control circuit of not only when it has the circuit which controls an electromagnetic wave source, but others is sufficient as a control circuit part.

[0022] In the work-example 3. above-mentioned work example 1, you may be a case so that the electromagnetic waves of others, such as although the case of inverter equipment was shown, not only when it is an inverter as an electromagnetic wave source which generates electromagnetic waves, but a power supply, may be generated. Moreover, the same effect as the work example which could be the last equipment which would be generated for the purpose of electromagnetic waves, and was mentioned above when electromagnetic waves were generated secondarily is done so.

[0023] In the work-example 4. above-mentioned work example 1, although the case where a shield layer existed in both an electromagnetic wave source circuit part and a control circuit part was shown, the case where it is not necessary to exist in both a power supply circuit part and a control circuit part, and exists only in one side is sufficient as a shield layer. Or the case where it does not exist is sufficient.

[0024] In the work-example 5. above-mentioned work example 1, although the case where prepared the plug terminal in the terminal by the side of a printed circuit board, and an electric socket terminal was prepared in the electromagnetic wave source side was shown, a case so that an electric socket terminal may be prepared in the printed circuit board side on the contrary and a plug terminal may be prepared in the electromagnetic wave source side is sufficient. Furthermore, the case where connection methods other than a plug terminal or an electric socket terminal are taken is sufficient. As [connect / even if it is that case / however, / an electromagnetic wave source / with a printed circuit board / free / attachment and detachment]

[0025] In the work-example 6. above-mentioned work example 1, although the case where a multilayer printed circuit board was used was shown, the printed circuit board does not need to be a multilayer and the case where it is only a printed circuit board is sufficient as it. Or you may not be the substrate used as the

pudding, and it does not matter even if it is the wiring board wired by the usual substrate.

[0026]

[Effect of the Invention] [according to the 1st - the mounting structure of the electric device by the 3rd invention] as explained above Use a mounting board as a multilayer printed circuit board, and a power supply circuit part and a control circuit part are separated on a substrate. A shield wall divides and also a shield layer in a power supply circuit part Furthermore, the bottom of the heap of a multilayer printed circuit board, Since it constituted from a control circuit part so that it might be considered as the top layer and an inductor might be prepared into a penetration capacitor and an output line between the entrance cable of an electromagnetic wave source, and a shield layer, the electromagnetic wave noise revealed out of a case can be controlled.

[0027] Moreover, according to the mounting structure of the electric device by the 4th invention, it writes with the structure which can detach and attach the terminal area of a multilayer printed circuit board and an electromagnetic wave source freely, and an assembly, service, etc. become easy.

[Brief Description of the Drawings]

[Drawing 1] It is the structure sectional view showing the mounting structure of the electric device by one work example of this invention.

[Drawing 2] It is the circuit diagram showing the electromagnetic wave source and its input-and-output line of drawing 1 .

[Drawing 3] It is the front structure sectional view showing the mounting structure of the conventional electric device.

[Explanations of letters or numerals]

1 Electric Device (Inverter Equipment)

2 Case

3 Multilayer Printed Circuit Board

4 Shield Layer

5a Power supply circuit pattern side

5b Control circuit pattern side

6 Insulating Board

7 Electromagnetic Wave Source

8 Metal Chassis

9 Module Board

10 Power Element

11 Input Lead

12 Output Lead

13 Plastic Case

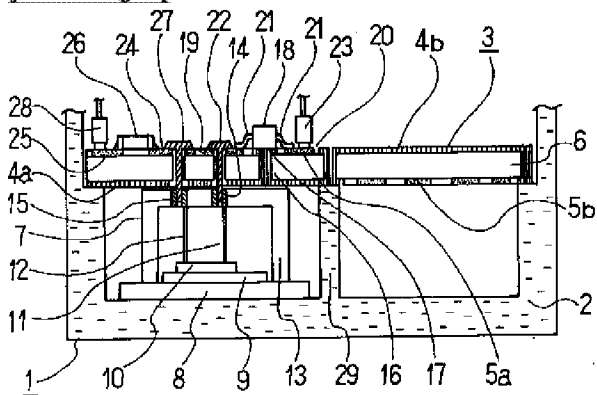
14 Electric Socket Terminal

15 Electric Socket Terminal

16 Through Hole

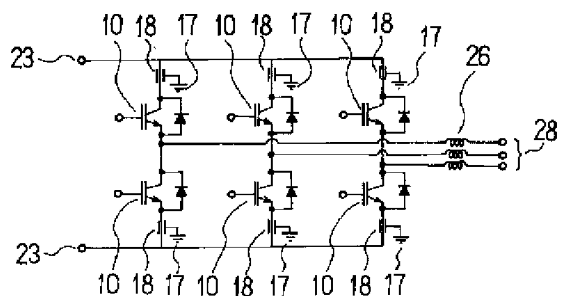
- 17 Spot Ground
- 18 Penetration Capacitor
- 19 Circuit Pattern
- 20 Circuit Pattern
- 21 Lead Terminal
- 22 Plug Terminal
- 23 Input Path Cord
- 24 Circuit Pattern
- 25 Circuit Pattern
- 26 Inductor
- 27 Plug Terminal
- 28 Output Path Cord
- 29 Shield Wall

[Drawing 1]



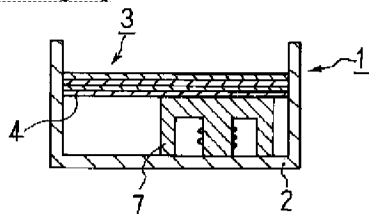
- | | |
|------------------------|----------------|
| 1 : 電子機器 | 11 : リード線 |
| 2 : 金属のケース | 12 : 出力リード線 |
| 3 : 多層プリント基板 | 13 : プラスチックケース |
| 4a : シールド層 | 16 : スルーホール |
| 4b : シールド層 | 17 : スポットアース |
| 5a : 電源回路パターン面 | 20 : 回路パターン |
| 5b : 制御回路パターン面 | 22 : プラグ端子 |
| 6 : 絶縁基板 | 23 : 入力接続線 |
| 7 : 電磁波発生源(インバータモジュール) | 26 : インダクタ |
| 8 : 金属シャーシ | 27 : プラグ端子 |
| 9 : モジュール基板 | 28 : 出力接続線 |
| 10 : パワ要素 | 29 : シールド壁 |

[Drawing 2]



- | | |
|--------------|------------|
| 10 : パワ-素子 | 23 : 入力接続線 |
| 17 : スポットア-ス | 26 : インダクタ |
| 18 : 貫通コンデンサ | 28 : 出力接続線 |

[Drawing 3]



- | | |
|--------------|------------|
| 1 : 電子機器 | 4 : シールド層 |
| 2 : ケ-ス | 7 : 電磁波発生源 |
| 3 : 多層プリント基板 | |

[Translation done.]